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NOVEMBER 26, 1949

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE

Raindrop Explosion

See Page 342

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NUCLEAR PHYSICS

Water Drop-Atom Analog

Calculations of forces acting when a water drop splits in a pattern like that occurring in atomic fission may help to interpret the nature of the atomic nucleus.

➤ HOW the nucleus of an atom of uranium or plutonium splits in two with release of immense energies may be more easily understood as a result of 12,000,000 calculating operations just completed on forces which act when a drop of water splits.

The research, advancing the validity of a liquid drop as interpreting the nature of an atomic nucleus, was planned and directed by John A. Wheeler, professor of physics at Princeton, who played a major role in the development of the atomic bomb, and David L. Hill, assistant professor of physics at Vanderbilt University.

In 1935, the renowned Danish physicist, Neils Bohr, suggested that scientists could simplify their thinking if they likened the nucleus of an atom to a simple drop of liquid. Based on this analogy it became possible to predict the fission of plutonium long before that element was known to exist.

Using the water drop analog, Prof. Wheeler and Mr. Hill calculated the forces, moments and velocities which would act on 11 points around the periphery of the drop. These were coded and fed in the form of a perforated tape to the selective sequence electronic calculator of the International Business Machines Corporation.

Six month's work was required to establish the codes. From then on the 12,500 electron tubes with their 23,000 relays, installed at a cost of $750,000, operated the numerical printers reeling out figures readily related to the drop as it changes its shape, constricts near the middle and finally splits, somewhat like the familiar mitotic cell division one sees in biology texts.

A hundred different shapes as outlined by the 11 points gave an equivalent of a slow-motion moving picture.

The results of the research show that when a drop of liquid splits the masses are unequal, substantially in the same ratio as occurs in atomic fission, that is a 3-to-2 mass ratio that occurs 500 times as often as a 1-to-1 mass ratio.

The nucleus of the isotope of uranium, U-235, the stuff from which the atom bomb was made, is held to be dumbbell shape. It takes more energy to split this nucleus, Mr. Hill said, than it would to split a perfectly spherical nucleus such as one might find in a hypothetical element, cosmium, entirely unknown, but which would have a theoretical atomic number of around 125 or 126.

The electronic calculator on which the work was done is said to be the only one capable of solving this sort of problem in atomic physics. The solution required 103 hours with an expenditure of 15,000 kilowatt hours of current, about as much as would be required to operate 150 household electric irons for 100 hours. The same calculations would have taken a high speed operator working with the best office type machines 150 years to complete, provided he made no mistakes. The calculator double checks on itself all along the line and stops dead if the figures do not tally.

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ENTOMOLOGY

Locust Swarms Predicted

➤ "THEY will come out of nowhere, without warning, by the billions, by the trillions. In the air there will be swarms of them 50 miles long, five to 10 miles wide and a mile or two deep."

This prediction of locust plagues to come, rivalling those of the biblical past, is from Dr. Clearhos Logothetis, FAO locust expert, reporting back from specially called locust control conferences in Pakistan and Lebanon.

He called the locust the "most important insect pest in the world today." It eats up millions of tons of food, consuming whole harvests at one feeding. He estimates the worldwide cost at "a bare minimum of $40,000,000 a year, which does not take into account the severe economic dislocations that result when an entire harvest is wiped out."

In the Near and Far East, and in Africa, Australia and South America locusts appear in unpredictable cycles, disappearing almost completely for a couple of years and then suddenly reappearing to do terrible damage.

He warned that the locusts will come again for a certainty until countries jointly ferret out and destroy the breeding grounds out of which they come sweeping.

It is now believed that locusts have relatively few points of origin, where they rest and build up their numbers between outbreaks. One such area is thought to be the Arabian desert. For reasons that are little understood, Dr. Logothetis explained, the Arabian locusts will suddenly start to breed prolifically, to change color, to become restless.

Their numbers grow enormously, until, as at a signal, the huge horde rises into the air, heading east. These migratory locusts eat their way from Iran, through Pakistan, into India. These three countries are now joining forces in an attempt to prevent the airborne attack from getting under way in the first place.

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AERONAUTICS

JATO and Parachute Brake Are Features of Jet Plane

➤ ROCKETS may be used to give rapid take-off to the new three-engine jet XB-51 plane built by the Glenn L. Martin Company for the U. S. Air Force, and a unique ribbon-type parachute braking technique will cut speed rapidly on the landing runway, it was revealed in Baltimore, Md.

Bringing a speedy jet plane to a stop on any but long runways is one of the problems encountered in promoting the use of turbo-jet power for planes. Airliners with conventional reciprocal engines and the familiar bladed propellers can be brought to a stop by the use of reversible propellers to assist the brakes on the wheels of the landing gear.

Considerable experimentation has been carried on during the past few years to find a way to cut the speed of a jet-propelled plane after it hits the landing strip. The trailing parachute is one. Another suggested is the use of rockets attached to the plane and pointed to the rear.

Rocket assisted take-off, JATO for short, is being used with considerable success with many new types of planes. The rocket power enables heavily loaded planes to get into the air which might not be able to do so otherwise. Rocket-assist enables other planes to take off after a shorter run than would be required without their help.

A new Junior Jato, stovepipe size and 18 inches long, develops 250 pounds thrust for 12 seconds duration. It is a product of Aerojet Engineering Corporation, Azusa, Calif. A Ryan Navion, equipped with Junior Jato, in a recent test reached a 50-foot altitude in only 300 feet from its starting point.

The 80-foot Martin XB-51, now undergoing testing, was designed for use in destroying surface installations in cooperation with ground troops. It is a speedy plane with three General Electric J-47 jet engines. It has wings and tail of the swept-back type, both at angles of 35 degrees. This new bomber has a parachute stowed aft which may be released at the pilot's discretion for more rapid deceleration of speed, in the air or on the runway. Neither Jato nor parachute are intended for use except in unusual situations.

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GENERAL SCIENCE

Fleet Bombing Obsolete

High-speed guided missiles, prime defensive weapons, now allow relative freedom from fear of atomic bombing by fleets of bombers.

➤ BOMBING by air fleets of the speeds and altitudes of the last war is now obsolete against a fully prepared and aleart enemy.

Because of this "logical conclusion," Dr. Vannevar Bush, head of American scientific research and development in the last war, believes that "we have less reason to be terrified by the thought of the A-bomb delivered by fleets of bombers."

Discussing this fear of many people today, Dr. Bush in a book just published, MODERN ARMS AND FREE MEN (Simon and Schuster), analyzes the changes caused by the advent of atomic energy applied to warfare.

Delivery of A-bombs by bombers can not be entirely discounted, but he writes that "the specter of great fleets of bombers, destroying great cities at will by atomic bombs is a specter only."

The high-speed guided missile is a prime defensive weapon that promises to neutralize the high-flying bombers. Says Dr. Bush:

"The high-speed guided missile can be used locally, like a gun, or carried to a threatened spot or fired from a plane. It has not the gun's limitations on ceiling and can go as high as the bomber. Its speed of a bullet pretty well guarantees it against being shot down in flight. Jamming is difficult. It is directed into its target and carries a proximity fuze. For defense of restricted areas it promises to be a deciding factor. It can be used air-to-air, but here again the interceptor can use it to better advantage than the bomber."

This guided missile, Dr. Bush indicated, should be ready for war use by the time there are great stocks of atomic bombs.

In his opinion, "it may well render all conventional mass bombing obsolete when two highly technical, alert and industrially advanced combatants clinch."

Despite this new method of defense, Dr. Bush warns that an enemy might with great losses get through to highly important targets. The means of defense is highly expensive and it must be alert, he observes. There are other means of delivery of atomic bombs than dropping them from the air, such as sneaking them into harbors in ships and planting them at the bottom of rivers.

Sneak raids and surprise attacks must be guarded against. The sneak bomber coming in at low altitude to avoid radar warning and too low to be fired upon effectively by batteries of guns and missiles might carry an atomic bomb to a target, even if it were destroyed itself in doing so.

Bombs might be lobbed into coastal cities by rocket projectors perhaps from submarines 25 to 50 miles at sea, Dr. Bush says in his book.

The question of whether germ or biological warfare will be used in the future depends, in Dr. Bush's opinion, upon whether an enemy can deliver the old and the newer toxic materials effectively. He does not beleive that mass delivery in an effective method is feasible, and biological weapons are not the absolute weapons, but more important in subversive operations than in open all-out combat.

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LIFESAVING "DOUGHNUTS"—The Sikorsky HO3S-1 helicopter equipped with a utility flotation gear employing carbon dioxide inflation, rides like a boat on the water after an emergency landing. Four inflatable bags, or "doughnuts," two flanking the forward wheel and one each on the two rear wheels, are connected by flexible hose to Kidde carbon dioxide cylinders with special discharge heads in the cockpit. The weight of the flotation gear is less than 150 pounds, and it not only permits take-off from calm or rough water, ice or snow but saves lives and aircraft in forced landings at sea.

NUCLEAR PHYSICS-METEOROLOGY

Industrial Atomic Energy Use Brings New Science

➤ THE development of atomic energy for peacetime industrial uses will make "stack meteorology" an important science of the future.

Norman R. Beers, editor of NUCLENICS Magazine, at the National Air Symposium, Pasadena, Calif., predicted that large atomic energy plants will put in the air materials that are either unusually toxic for chemical reasons or measurably radioactive.

Mr. Beers defined "stack meteorology" as "the entire problem of air pollution from stacks of chimneys as the meteorologist sees it."

The fogging of photographic plates occurred a thousand miles from the first atomic bomb explosion in New Mexico, Mr. Beers recalled. Dust from the great Krakatoa volcano has travelled around the world. Industrial smoke and fumes are likewise carried greater distances than is generally realized.

"Aviators have seen smoke from large cities adequate to dirty their windshields and to decrease visibility up to 300 miles away from the smoke source," he said.

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AERONAUTICS-MEDICINE

Safer Parachute Jumps

➤ HIGH priority for the problem of getting a man safely down after he parachutes from a plane was urged by Comdr. H. A. Smedal of the U. S. Navy Medical Corps before the Association of Military Surgeons meeting in Washington, D. C.

He stressed this because most of the emphasis has been on the safe escape from a plane using such devices as the ejection seat.

The parachutist faces possible shock when he first leaves the plane, Comdr. Smedal said. Moreover, the parachute harness places the impact of the opening on the crotch and thighs. Other parts of the body may also get part of the impact with the air or with parts of the parachute as it opens and injury may result.

He makes the following suggestions to protect the body against the shock of the parachute opening: 1. distribute the area of impact over a larger part of the body; 2. place the impact load on the parts of the body best able to stand it and near the center of gravity of the body; 3. lessen the extent and duration of the force; 4. orient the body in taking the proper position for opening of the parachute which is the vertical position.

Few of the suggested improvements have been made, he said. Parachutists still have narrow harnesses which cause local injuries. A rip-stop nylon parachute has been developed which gives a softer and surer opening, and decreases the rate of descent by about 15%. Automatic opening devices have been made but they do not always work.

Among other unsolved problems is the one of the jumper striking the ground and fracturing his legs.

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MEDICINE

Theory of Heart Murmurs

➤ A TEAM of physicians using a new type stethoscope and modern electronic devices have upset the predominant theory by which doctors have explained how the blood vessels transmit heart murmurs.

Heart murmurs, as heard by the stethoscope, long have been considered to be transmitted as sound through the blood vessels. Heart murmurs are the distorted sounds set up in the cardiovascular system by damaged hearts, blood vessels, or by obstructions.

The team of physicians, at the University of California Medical School, determined that the murmurs travel only one one-hundreth as fast as the speed of sound in blood vessels.

The physicians found that the murmurs traveled at almost identically the same speed as, but slightly slower than, the pulse wave, which is the forward impulse set up in the blood vessels as the heart pumps blood.

They concluded that the murmurs actually travel on this pulse wave. The information is important in the diagnosis of heart ailments.

The team of physicians was headed by Dr. William J. Kerr, and included Drs. Vernon C. Harp, Elliot Rapaport and Howard R. Bierman. A part of the continuing research has been published in the AMERICAN HEART JOURNAL and the TRANSACTIONS OF THE ASSOCIATION OF AMERICAN PHYSICIANS.

The measurements were made by means of the symballophone, a special type of double stethoscope for comparing sounds and indicating their direction, developed by Dr. Kerr, and by means of electronic devices and strain gauges applied to the measurement of physiological pressures.

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MEDICINE

Tibione May Fight TB

Treatment of TB with a new German synthetic drug has given "most impressive" results. It would be used together with streptomycin in TB treatment.

➤ A NEW weapon may soon be available for the fight against tuberculosis. It is a German synthetic drug called Tibione.

More than 7,000 patients have been treated with the drug in Germany during the past two years, with "most impressive" results in some forms of tuberculosis.

Tibione is untried and almost unknown in this country. But at the Eighth Streptomycin Conference in Atlanta, Ga., Drs. H. Corwin Hinshaw of the Mayo Clinic, Rochester, Minn., and Dr. Walsh McDermott of the New York Hospital—Cornell Medical Center, New York, reported results of a survey they made in Western Germany in September of the trials German physicians have made of Tibione.

"Tibione," Dr. Hinshaw said, "appears to have antituberculous activity of the same general order as para-amino-salicylic acid and a potential toxicity about like the arsenicals used in the treatment of syphilis."

If no "superior" anti-TB chemicals are developed, he said, a drug with these apparent degrees of anti-TB activity and toxicity would be "an important addition" to currently available germ-fighting chemicals.

"It is virtually certain," he declared, "that Tibione will not replace streptomycin but would be used together with streptomycin in the treatment of tuberculosis."

The American physicians were most impressed with the results obtained in Tibione treatment of certain serious complications of extensive tuberculosis of the lungs, especially tuberculosis of the larynx (voice box) and of the intestinal tract.

The drug is not sufficiently powerful to have much effect on most cases of tuberculous meningitis and miliary (not military) tuberculosis. German physicians now give streptomycin to these patients.

Tibione is neither as dependable nor as rapid in its action in tuberculosis of the lungs as streptomycin.

If, as seems likely, TB germs do not develop resistance to Tibione and the drug does not produce serious toxic effects, it could be depended on to continue fighting the germs for many months of treatment. This would give it "very great usefulness" in many chronic types of tuberculosis for which streptomycin usually cannot be prescribed.

Tibione was developed by Drs. Robert Behnisch and Fritz Mietzsch and Prof. Hans Schmidt of the Bayer Company. Its effectiveness against the TB germ in the test tube and in animals was discovered by Prof. Gerhard Domagk, who was awarded the Nobel Prize in 1939 for his discovery of the anti-germ activity of the sulfa drugs.

Drs. Hinshaw and McDermott made their survey as consultants for Schenley Laboratories. Schenley will make the drug available to certain government agencies, tuberculosis research organizations and other qualified clinical investigators for trials and study in this country. If the German results are confirmed Schenley will produce it for use by physicians in the United States.

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GEOLOGY

Iceberg Count Made

➤ ANOTHER government census is now completed and a summary issued. It is the "iceberg census" of the Baffin Bay region. The count, taken by aerial photography, totals 40,232 icebergs during the 1949 operation. These bergs later may become a menace to shipping in the Atlantic.

This iceberg count job is a function of the U. S. Coast Guard. Counting is done to anticipate and forecast ice menace to North Atlantic shipping. Many hundreds of those spotted will disintegrate on the 2,000-mile trip before reaching the shipping lane. Others will not. Danger from them to ocean vessels on the usual routes from the United States to Europe is kept at a minimum by the iceberg patrol kept by the Coast Guard during the iceberg season.

Greenland glaciers are responsible for the North Atlantic iceberg menace. Twenty of them on the west coast along Baffin Bay are responsible for most of the icebergs that drift toward the Grand Banks off Newfoundland in the shipping lane. Coast Guard units in surface ships and airplanes keep careful watch for these great masses of ice during some five months of the year. Their exact geographical location is determined by sextant or loran and widely broadcast by radio for the benefit of vessels.

The use of loran for this purpose is a postwar application. Loran itself is a wartime development. It enables a vessel to get its location by intercepting radio beams from two widely separated special broadcasting stations. Loran can be used when the sextant is useless because of fog or darkness. It is a particularly desirable device for use in the North Atlantic, an area blanketed by fog from April to July each year.

Two converted Air Force B-17s were used in the aerial iceberg count. Cameras were installed in plexiglass bubbles on each side, and thousands of pictures were taken. The only sure sign of an iceberg is to see it, the Coast Guard declares, but the camera "sees" it better than the human eye.

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MEDICINE

New Chemical Effectively Treats Many Allergies

➤ GOOD results with a new, longer acting chemical for hay fever and other allergies were reported by Drs. Louis Cullick and Henry D. Ogden of Louisiana State University Medical School and Charity Hospital, New Orleans, at the meeting in Cincinnati, Ohio, of the Southern Medical Association.

The chemical is Perazil chlorcyclizine. It is an anti-histamine chemical but differs from others developed in the fight against hay fever, asthma and so on in its longer action. This means that patients need take only one or two tablets daily.

The 30 patients, 27 with hay fever,

LAST ICEBERG—A member of the veteran ice patrol aboard the Coast Guard cutter, Evergreen, keeps his eye on the last iceberg of the season. Disposing of this one did not spell finis though, for when the ice patrol ends, it is only the beginning of the iceberg census which counts the bergs constituting a potential menace to North Atlantic shipping.

to whom the New Orleans physicians gave these tablets got only one week's supply at a time. The second week they were given a supply of tablets that looked just like the Perazil but did not contain any of it or any antihistaminic chemical. The following week they again got Perazil tablets, and so on for 14 weeks. The patients did not know they were getting different tablets every other week. They were also given a chart on which to record the time of onset of each attack of hay fever, hives or rhinitis, the duration, and whether it was mild, moderate or severe.

Although there was no significant difference in the mild and moderate symptom groups while on Perazil and the dummy tablets, the attacks lasted longer when patients were taking the dummy tablets.

There was, however, a marked difference in severe symptoms, 26 hours per week, roughly, when taking Perazil, compared to about 171 hours on the dummy tablet. Also, the number of hours of all kinds of symptoms, mild, moderate and severe, averaged 209 per week for each patient taking Perazil and 521 for the patients while taking the dummy tablets.

The scarcity of side reactions "is worth noting," the doctors pointed out. Of 30 patients, only four reported drowsiness and and one headache.

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ENGINEERING

Football Players' Device

➤ FOOTBALL coaches and fans, attention: have you heard of the ammonia gas-filled earpiece inside a helmet by which a quarterback on the field could receive instructions from the bench?

Such a device has actually been patented by Dr. W. D. Hershberger of the engineering department of the University of California at Los Angeles.

The U. C. L. A. engineer, who helped to devise the fabulously accurate atomic clock, says that the principle on which the clock works can be utilized in a practical bench-to-huddle "intercom" system.

This principle is the absorption of microwaves by the ammonia molecule. Put a narrow-beam voice-modulated microwave generator on the bench and the ammonia gas-filled earpiece in the quarterback's headgear and the coach could communicate with the huddle at will.

"It might save penalties against the team when substitutes are illegally sent in with instructions from the coach," he suggests.

The scholarly research engineer, who spends most of his time on more serious applications of this principle, has conceived of other gridiron applications of the same idea.

Fill the pigskin itself with ammonia gas, says Dr. Hershberger, and the quarterback wouldn't even need an earpiece in his helmet. When the ball was cocked behind his ear he could get such instructions from the bench as "the end going wide to the left is now open for a pass" or "beware of the opposing tackle coming in on your right."

One other variation is this: when the ammonia-filled ball was in the air, the coach could speak directly in code to the end going down field. Thus he would have more time to fake the defensive halfback instead of twisting his head around to look for the ball.

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CHEMISTRY

Better Shoe Soles Made

➤ BETTER soles for shoes result from impregnating leather with natural rubber in a process developed by the National Bureau of Standards just revealed.

Tests already made show that the rubber-treated leather soles have improved wearing qualities over untreated leather and are better able to resist abrasion and water.

Sub-standard leather, such as "belly-cuts" from steer hides, make satisfactory soles after the rubber treatment and can now be used for the purpose.

The new treatment process was developed by Rene Oehler, Timothy J. Kilduff and Sverre Dahl of the Bureau staff. The impregnation is accomplished by simple immersion of the naturally porous leather in a solution of natural rubber. Solutions have been made with guttapercha gum, Hevea, and Castilloa rubber. Hevea smoked sheet rubber proved to be the best of the group for the purpose.

After impregnation the deposited rubber may be vulcanized at 80 degrees Centigrade with the aid of an accelerator of the dithiocarbamate type without harming the leather.

In the development work it was found that if the grain layer of the leather is split away and the body of the leather is allowed to remain in solution overnight, the penetration and distribution of the rubber are greatly improved.

Tests show that water transmission and absorption of the rubber-treated leather are only 50% as much as untreated specimens, and that abrasion resistance of vegetable-tanned crust leather is improved from 50% to 100%, depending on the type of rubber treatment used.

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Words in Science— CATHODE RAY TUBE

➤ THE cathode ray tube is a bulb of glass that contains a high vacuum. Electrons are shot out by a heated filament at the base of the tube toward an anode. A narrow beam of electrons passes through a small hole in the anode and continues on to the end of the tube which is a screen coated on the inside with a substance which fluoresces (glows) when the electrons strike it.

The cathode ray tube is the heart of your television receiver. In use, the bright spot caused by the stream of electrons sweeps rapidly over the screen while its brightness is controlled to match variations in brightness of the object televised.

Persistence of screen fluorescence plus persistence of vision make you have the illusion of an image on the television screen.

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MEDICINE

More People May Soon Be Vaccinated Against TB

➤ MORE people may soon be getting vaccinated against tuberculosis as a result of action by the National Tuberculosis Association.

That organization's medical section, called the American Trudeau Society, recommends that commercial firms be licensed to produce BCG, the anti-TB vaccine, as soon as suitable standards for its production can be set up.

BCG, short for Bacillus Calmette-Guerin, is made from cow tuberculosis germs that have lost their virulence, or ability to produce disease. The vaccine is the most practical known material for giving immunity to tuberculosis and has been widely used in Europe.

In the United States the vaccine has been restricted to use in controlled, scientific studies because of many unanswered questions about its value. It is given only to persons who do not react to a tuberculosis skin sensitivity test.

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On This Week's Cover

➤ THE gentle pitter-patter of raindrops is an illusion of the eye and ear, for each raindrop smashes into the soil like a bomb, scattering bits of shattered earth. This explosive action is demonstrated in the picture, shown on the cover, made with a stroboscopic camera by W. D. Ellison, soil conservationist with Navy's Bureau of Docks and Yards, in cooperation with a Naval Research Laboratory photographer. The effect of exploding raindrops on the soil known as splash erosion is a prime force in soil displacement.

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MEDICINE

Atherosclerosis Theory

Fat particles circulating in the blood may lead to hardening of the arteries. Lipase and a detergent, Tween 80, reduced the particle count in older persons.

➤ FRESH evidence for the theory that fat particles circulating in the blood lead to a kind of hardening of the arteries, called atherosclerosis, appears in studies by Drs. G. H. Becker, Jacob Meyer and H. Nechels of Michael Reese Hospital, Chicago.

Two chemicals, a fat-splitting ferment called lipase and the detergent, Tween 80, seem potential drugs for preventing the condition or arresting its progress, although the scientists say "it is premature to speculate" on this.

A test meal of white toast spread with oleomargarine and a cup of tea was used in the studies, reported in the scientific journal, SCIENCE (Nov. 18). After this meal, the number of fat particles in the blood of younger people rose to a peak within two to three hours and returned to the fasting level by the end of the fifth hour. But in the older people the number of fat particles did not reach their peak until eight or 12 hours and did not return to fasting level until 24 hours had elapsed. Also the total number of these fat particles was consistently and considerably higher in the older persons than the younger ones.

Feeding either lipase or Tween 80 with the fat meal reduced the number of fat particles in the older people's blood to practically that of the younger age group. But the count of fat particles in the young group following the fat meal was not much affected by giving lipase.

The effect of lipase or the detergent on the number of fat particles in the blood of the older people seems to support the idea that mechanisms of fat digestion or absorption, probably both, change with aging, the scientists point out.

"Since all people eat some fat at least once a day," they state, "increased numbers of fat particles circulate in the blood of older persons practically permanently. If it is true that particulate fat, circulating in the blood, leads to atherosclerosis, the condition leading to that degenerative disease has been found."

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ENGINEERING

Energy Wastes from Fuels

➤ TWO-THIRDS of the energy from the coal, oil and gas consumed in the United States is wasted in stack gases or exhaust gases or radiated to the air, four scientists of Socony-Vacuum Oil Company told the American Petroleum Institute in Chicago.

The remedy lies in better usage and they explained how this can be accomplished, particularly in the automotive and entire transportation field. The presentation was a joint paper by W. M. Holaday, R. E. Albright, T. L. Apjohn and L. R. Steffens, all of the Socony-Vacuum Laboratories, New York.

According to these authorities, energy is derived in this country principally from coal, petroleum and natural gas, with water power and wood supplying about 10%. Petroleum and natural gas together account for about 50%, coal supplying the largest portion for industrial power and heat.

Transportation requirements, amounting to 36% of the country's net energy needs, appear to be subject to the greatest reduction through improvements in utilization efficiency. Automotive equipment offers the most fertile field in this area, they stated. Present weighted overall efficiency under normal operating conditions is only six percent.

One manner of increasing automotive efficiency is by raising compression ratio in engines. An alternate to increasing compression ratio is the application of supercharging. One means for improving economy is the use of a smaller engine which would operate without supercharging most of the time but would use this power-boosting device when high power is required.

A more recent proposal is based on the use of a small continuously supercharged engine and recovery of the exhaust-gas energy in a gas turbine geared to the engine. In effect, this would give the higher efficiencies obtainable at high compression ratios, but without the higher octane-number associated with increase in compression ratio.

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ENGINEERING

Glass Fiber Is Key To Fire-Protection Suit

➤ GLASS fiber is the key to a protective suit that will enable a man to work in safety in a raging fire. It was developed at the Wright-Patterson Air Force Base, Dayton, Ohio, and is designed particularly to keep aircrash firemen safe when working in a fire of gasoline and oil.

The suit is made up of 18 layers of glass fiber, glass fiber batt, glass fiber net, neoprene-coated glass fiber, honeycombed cotton cloth, silver foil, aluminum foil and nylon, Air Force officials state. These materials are arranged so that they provide the best possible protection yet devised against both the conductive and radioactive heat experienced in aircraft fires.

In all, the suit is about one-half inch thick, and gives the lowest possible bulk and weight consistent with its insulating function. The material is able to withstand abrupt and extensive changes in temperatures without loss of physical characteristics. It is not injured by water, oil, common solvents, fuels, lubricants or fire-fighting agents.

The suit, complete with asbestos-soled shoes, head covering and mitten-type gauntlets, weighs 29 pounds. Under tests, a man wearing this protective suit remained a minute and a half in a wall of flame at 2400 degrees Fahrenheit without experiencing bodily discomforts.

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FIREPROOF SUIT—This gleaming white suit made of 18 layers of various glass fiber materials and aluminum foil arranged to provide the best possible protection against both conductive and radioactive heat is the first ever designed by the Air Force to permit actual entry into flames. It will be worn by four members of 20-man aircraft crash fire-fighting teams recently organized by the U. S. A. F.

ASTRONOMY

Two New Minor Planets In Trojan Group Reported

➤ TWO new minor planets, whirling around the sun, 60 degrees ahead of Jupiter but following the same orbit, have been reported to Harvard Observatory, Cambridge, Mass., by Dr. K. Reinmuth of Heidelberg, Germany.

Confirmation of their existence by American observers is expected as soon as conditions for photographing this region in Jupiter's path allow astronomers to take pictures of these very faint objects. Magnitude of the yet un-named asteroids is about 15, thus requiring a fairly large-sized telescope for observation.

Dr. Reinmuth was the discoverer of another asteroid, named Hermes, that holds the present record for the closest approach to the earth. On Oct. 30, 1937, this little celestial body, with a diameter estimated at only one mile, came within 485,000 miles of the earth. This is closer than any other object in the sky, execept the moon, has ever approached the earth.

The two new asteroids are part of the Trojan group, named after the heroes of Homer, and occupy a fixed position with respect to both Jupiter and the sun. There are now 12 known asteroids of this group, the first having been reported in 1904, after its existence was predicted by the French mathematician LaGrange.

Science News Letter, November 26, 1949

METEOROLOGY

European Meteorologists May Use Hemisphere Data

➤ IF Europe becomes international in its weather forecasting, people on the other side of the Atlantic will have more chance of knowing in advance what the weather is going to be.

This was learned by an American meteorologist, Jerome Namias, long-range forecasting expert of the U. S. Weather Bureau, during an eight-month study of European weather practices.

America's weather maps are based on data collected from the whole Northern Hemisphere. Europe's maps are drawn chiefly from local European data. By employing the hemisphere concept, Europe will obtain a larger and therefore more accurate picture of future weather.

European meteorologists, Mr. Namias found, were highly receptive to the hemispheric concept. The biggest obstacle to putting it into immediate operation, they told him, is the cost. Data from weather stations which girdle the Northern Hemisphere are already available. But properly equipped collecting and transmitting stations are costly. There is also a shortage of trained personnel needed to appraise and interpret the data.

Some steps have already been taken to overcome this difficulty, notably by the International Meteorological Organization which has placed this problem high on its agenda.

Since 1935 when the hemispheric idea was first jointly explored by the Weather Bureau, the Department of Agriculture, and Massachusetts Institute of Technology, the original North American system of weather stations has been widely enlarged. It received an additional impetus during the war, until now it includes a far-flung network of weather ships, upper-air sounding stations, and other observation points scattered throughout the North American and Eurasian continents.

All these observations of local weather conditions and of air circulation are sent by radio so they can be received by all countries, including Russia and the nations of Europe. They are used in making the weather predictions that help keep the air lines running. Prediction charts of general weather conditions four and five days ahead are made and longer-range forecasts are also possible.

Science News Letter, November 26, 1949

PSYCHIATRY

Share and Discuss Worries and Anxieties

➤ BEST thing to do for the worries and anxieties of daily life is to share and discuss the worrisome problem or situation, two University of California psychiatrists conclude from a special study of worry.

The following ways of handling worry are not grown-up and not effective, the psychiatrists, Drs. Jurgen Ruesch and A. Rodney Prestwood, state:

Overindulgence in eating, drinking or smoking; trying to suppress or conceal the worry; trying to establish a feeling of "belonging" by social contacts, from conversations about the weather to club activities; trying to control the actions of friends or relatives or dictating to them.

They report their study in the current issue of the ARCHIVES OF NEUROLOGY AND PSYCHIATRY (Nov.), an American Medical Association publication.

A new cause for worry for some people appears in a report to the same journal by Dr. Herbert Barry, Jr., of Harvard Medical School.

Loss of mothers, through death or separation, at a younger age than eight years may contribute to a later development of mental illness, Dr. Barry found.

Psychiatrists searching for causes of mental illness, he points out, now tend to think there are multiple factors at work instead of just one, and that the periods in life at which psychological hurts occur are also important.

Science News Letter, November 26, 1949

IN SCIEN

NUTRITION

High Fat Diets Do Not Always Cause Obesity

➤ TO KEEP from getting fat, you don't have to stop eating fats entirely. People can learn from the rats studied by Dr. Harry J. Deuel, Jr., graduate school dean of the University of Southern California.

While the regulation of diet in a particular case can best be done under medical control, investigations by Dr. Deuel show that high fat diets do not necessarily cause obesity.

High fat diets in animals remain in the stomach over a prolonged period, maintaining satiety for a longer time and thus preventing excessive caloric consumption.

Fats, considered as desirable constituents of the diet, may vary from nothing to a fairly generous amount without appreciably altering the nutritional value of the diet. Fats serve as a source of the essential fatty acids and under certain conditions, of fat-soluble vitamins. They also contribute markedly to the tastefulness of the diet.

In his study of rats, reported to the American Dietetic Association, Dr. Deuel found that diets containing 20% to 40% fat by weight have the highest nutritional value, as judged by growth studies. Capacity for work and survival are more satisfactory for rats on diets containing generous amounts of fat than for animals on fat-free regimes.

Science News Letter, November 26, 1949

ZOOLOGY

Female Sharks Are More Numerous than Males

➤ AMONG the sharks, the females are more numerous than the males.

Investigating the sex life of the basking shark, Dr. L. H. Matthews of the University of Bristol reported to the Royal Society in London, England, that he has found that the sex ratio in the commercial catch is 30 or 40 females to one male. Just what are the relative numbers at birth is not known.

The shark, although a fish, brings forth its young alive, like mammals and unlike most fish. The mother shark is very prolific so far as eggs are concerned, since she produces at least 6,000,000 at one time, most of which do not develop.

While the mating of the particular kind of shark studied by Dr. Matthews takes place in surface water inshore in the early summer, the expectant mothers seek privacy by migrating elsewhere and do not reappear until after their young are born.

Science News Letter, November 26, 1949

E FIELDS

VETERINARY MEDICINE

Screw-Worm Infection in Livestock Is Rising

➤ A SERIOUS rise in screw-worm infection among livestock in the Southeast is the object of close government scrutiny. it was revealed in Washington, D. C.

Although figures are still not available on the amount of damage done, Dr. L. S. Henderson of the Bureau of Entomology and Plant Quarantine said that this is "the worst year in the history of the insect in the Southeastern area." For the first time infection has been reported in New Jersey, well north of its usual range.

Last year's mild winter is to blame for the current outbreak, Dr. Henderson said. The infection, which occasionally occurs in man also, develops when the adult screw-worm fly lays its eggs in wounds in the animal's skin. If untreated, more eggs are laid, the sore grows and the animal dies. The mild weather permitted the adults to over-winter far north of their usual winter refuge, so that when warm weather returned they got off to an early start.

No prediction for next year is yet possible. It will depend on the severity of the coming winter. If it is mild, a repetition of this year's outbreak is highly likely.

Livestock acquire wounds in a variety of ways, among them tick bites, goring, bramble scratches, and in the branding and dehorning operations. Owners can effectively prevent loss by treating all such skin breaks promptly.

A chemical preparation called "Smear 62", developed by the Department of Agriculture, gives good results, Dr. Henderson said. The important thing, he stressed, is that it be applied in time. It has a double action, repelling the egg-laying adults and killing the larvae.

Science News Letter, November 26, 1949

GENERAL SCIENCE

Cigarettes Smoked Hit All-Time High

➤ A RECORD high in the number of cigarettes smoked by the American public was hit this year, figures released by the Department of Agriculture show.

More persons are expected to be smoking next year because of population increases, their report also shows.

If every adult in the United States consumes his share this year, each man and woman will have smoked 3,400 cigarettes by New Year's Day, or about 170 packs. This figure includes non-smokers. Based on smokers alone, the average consumption would of course be much higher.

Cigarette smoking, says the Department of Agriculture, for the last four years has been double what it was for the five years just before the war. Consumption this year totals 358 billion cigarettes. For the period 1935 to 1939 the average was 157 billion.

The figures are rising in spite of "the higher tax rates or new cigarette taxes levied in seven states, the District of Columbia, Alaska, and Hawaii in recent months." There will probably be even more smokers in 1950 because of the population increase.

Cigarette exports for the year are estimated at 21 billion cigarettes, which despite a drop from last year is roughly four times what it was before the war.

Science News Letter, November 26, 1949

SOCIAL PSYCHOLOGY

Radio Give-Away Answers Desperate Need of Many

➤ THE radio give-away program is the one hope for fulfilling some desperate need for many people. It is the "good fairy" of this mechanistic age, making the ordinary housewife into a Cinderella.

This is the conclusion of Dr. Franklin Fearing, professor of social psychology at the University of California. Dr. Fearing made a study of 16,000 wishes expressed by contestants on one of the oldest give-away programs for which the gifts are chosen on the basis of wishes written out in advance by the contestants.

More than a third of the contestants wanted to escape from the humdrum of daily life by way of a special experience such as a trip to Bermuda or a date with a movie star. Another 30% wanted some practical thing such as a washing machine or vacuum cleaner. Only 13% wanted luxury items like a television set or mink coat, and a mere 4% asked for bizarre or unrealizable wishes.

On the basis of the sample interviews, the typical contestant in this program is 29 years old, has gone to high school or college, is married, has one or more children, and is a housewife.

The majority of winners reacted favorably to the experience. They felt that in addition to the gifts received, the experience raised them in the opinion of their families, neighbors and friends.

A significant minority, however, felt that the ordeal they underwent before the wish was finally fulfilled made its realization an anti-climax. Some said it "really wasn't worth it."

Interviews of "also-rans" indicated that frustration of those who almost made the grade, but faltered in the final selection was often a bad emotional experience, and in many cases actually created a serious psychological condition.

Science News Letter, November 26, 1949

ENGINEERING

"Rail Cancer" Is Licked By Controlled Cooling

➤ NO "rail cancer" has been found in any railroad rail made since 1938 with use of a controlled cooling system, it was reported by Prof. R. E. Cramer of the University of Illinois to a joint committee of the American Railway Engineering Association and the American Iron and Steel Institute.

Rail cancer is a fatigue failure that comes with usage. Studies made in the early 30s by scientists of the University of Illinois found that the cancer began from minute flaws called shatter cracks within the head of the rail, and that controlled cooling could prevent them.

This cooling cure was put into operation by the rail makers in 1935. Of the 10,000,000 rails made since then only seven have failed by cancer, and all seven were rails made before 1938 and all by one mill that used defective cooling equipment. Of the rails made before 1935, as many as 40,000 a year are now failing.

Science News Letter, November 26, 1949

MEDICINE

Gas Meter Converted to Lung Function Testing

➤ A GAS meter, such as homeowners have in basement or kitchen, can be converted to an instrument for testing lung functioning, Dr. Charles W. Lester, of Roosevelt Hospital, New York, reports in NEW YORK MEDICINE, (Nov. 20), journal of the Medical Society of the County of New York.

About the only test of lung function made in hospitals that do not have elaborate special equipment, Dr. Lester points out, is the test of the patient's "vital capacity." This means the measure of the greatest possible amount of air that can be exhaled after the deepest possible inhaling of air.

This is of about as much value in estimating lung function, Dr. Lester says, as measuring the size of a leg is in estimating its functional capacity.

Besides the measurement of the mechanical movement of air in and out of the lungs, the physician needs to know how much oxygen and carbon dioxide pass across the thin membrane separating the blood vessels from the tiny air spaces in the lungs, called alveoli.

It is for this latter measurement that the gas meter with flutter valves can be used, Dr. Lester reported. He credited Dr. Ralph Friedlander and Dr. William M. Chardack of the Veterans Administration Hospital at Castle Point, N Y., for demonstrating the availability of this new lung function testing device.

Science News Letter, November 26, 1949

ASTRONOMY

Orion Prominent in East

The planets of Venus, Jupiter, Mars and Saturn can be seen either early or late. Sirius, one of the closest stars, appears to be the most brilliant.

By JAMES STOKLEY

➤ THOUGH four planets may be seen on the evenings of December, one has to look for them either early or late. Thus, they do not achieve a place on our maps, for these depict the heavens as they appear about 10:00 p. m. at the beginning of the month, and an hour earlier in the middle.

If you look low in the southwestern sky soon after the sun has set you will see two planets in the gathering dusk. The brighter will be Venus, which reaches greatest brilliancy the day after Christmas, when it is about 58 times as bright as a typical star of the first magnitude. The other planet is Jupiter. Though this is really very bright, it is only about a twelfth the brilliance of Venus, which is now at one of its extremes.

At the beginning of the month, Venus will be to the west of Jupiter, but passes it on the evening of Dec. 6. The time of closest approach (10:00 p. m. EST) will be after the planets have set in the eastern part of the country, but in the west they will still be visible. Even along the Atlantic coast, however, they will form a strikingly close pair that evening before they disappear behind the western horizon. And on Dec. 22, the crescent moon passes them, adding to the spectacle.

Mars and Saturn in East

Our other two December planets rise in the east about midnight, and these also are very close together. They are Mars and Saturn. Of very similar brightness at present, Mars is of magnitude one, while Saturn is about five-sixths as bright. The red color of Mars, fortunately, makes it easy to identify. Mars has been to the west of Saturn, but on Nov. 30 passed its fainter brother, and during December is toward the east and south, gradually drawing farther away.

Among the stars of the month, the brilliant constellation of Orion, the warrior, is most prominent, as he always is in our winter skies. To locate him, look to the southeast, for the three stars in a row that mark his belt. The two bright stars just above, of which Betelgeuse is one, mark his shoulders, while Rigel, below, is in one of his feet. As depicted in the old star maps, which showed the actual figures around the stars, he is depicted as holding an upraised club, defending himself from the charge of Taurus, the bull. This animal forms another constellation, above and to the right, with first magnitude Aldebaran as one of his eyes.

Stars of Month

On the other side of Orion, shown low in the east, are the two dogs, Canis Major and Canis Minor, which contain the stars Sirius and Procyon. Of all the stars we see in the night-time sky, Sirius is brightest, almost as bright as Jupiter. Actually it is not so bright as stars go, but looks so brilliant because it is one of the closest of the stars.

Alongside Orion, to the north, we can see Gemini, the twins, with the stars Castor and Pollux, the latter the more brilliant. And above them we find Auriga, the charioteer, with Capella, still another star of the first magnitude.

Calendar Erroneous

With the arrival of December, and the imminent approach of another year, the calendar comes to mind, and this time it seems to have particular significance, for the transition from the first to the second half of the 20th century is not far off. Already the letters in one national weekly have discussed candidates for the title of the "man of the first half century." Many of these correspondents doubtless think that the half century will end this month, and that Jan. 1, 1950, will begin the second half. No doubt there will be much discussion of the problem, as there was in January, 1900, when many, many persons thought that the 20th century was starting.

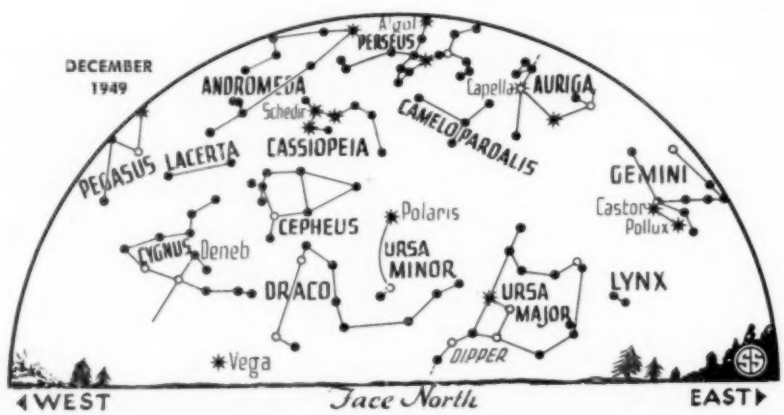
Actually, however, 1900 was the last year of the 19th century. The 20th century began on Jan. 1, 1901, and the second half of that century will begin Jan. 1, 1951. This is readily apparent when we consider the beginning of the Christian era, which we use in our reckoning, and the fact that it takes 100 years to make a century, just as it takes 100 cents to make a dollar.

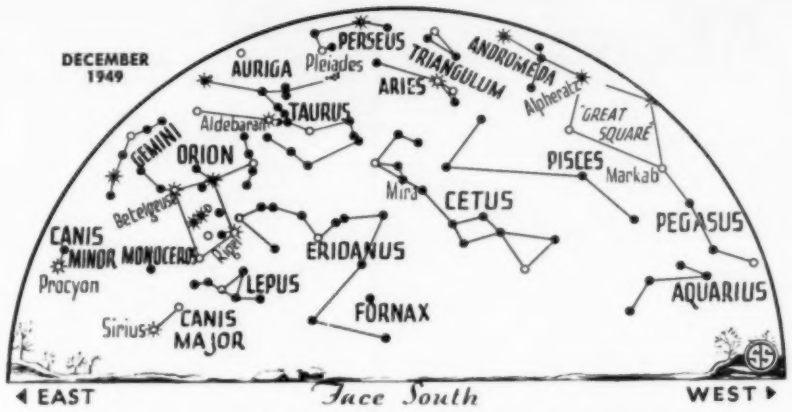
If you are saving money, a cent at a time, your first penny starts your first dollar. When you have 99 pennies, however, you do not have a dollar, but that is completed with the hundredth. Penny number 101 starts your second dollar, which is completed when you have a total of 200. With 1,899 pennies you are one cent short of $19.00, for 1,900 are needed to make that amount, and the 1,901st penny starts your twentieth dollar.

Exactly the same reasoning may be applied to the years. The year 1 A. D. was the first of the first century, which was completed at the end of the year 100 A. D. The second century began with 101, the third with 201, and so on, until 1901, which began the 20th century. Since 1950 completes 50 years, which is a half century, the second half of the present century begins on Jan. 1, 1951, and will end on Dec. 31, 2000.

Although we use the term "anno domini," or "the year of our Lord," and say that this is the year 1949 by that reckoning, it is a fact that Christ was born at least 1,953 years ago. We know that He was born during the reign of King Herod, who, according to the Jewish historian Josephus, died shortly after an eclipse of the moon. The only eclipse which could fit was one that occurred March 13, 4 B. C., so evidently the Nativity was earlier than that.

It was not until the early part of the sixth century that a monk named Dionysius Exiguus introduced the practice of counting years from the birth of Christ. Prior to that, in countries connected with the Roman Empire, years had been counted A. U. C.—"from the founding of the city," i. e., of Rome. Dionysius followed a tradition that





☼ ✱ ○ • **SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS**

Christ had been born in the 28th year of the reign of the Emperor Augustus, and assumed that this reign started in the Roman year 727. Adding 28 years brought him to the year 754 A. U. C., so Dionysius took this as 1 B. C. in the new reckoning, and made the following year, 755 A. U. C., the year 1 A. D.

The monk was mistaken. It was in 727 that Augustus began his reign under that name, but he became emperor four years earlier. This was after the battle of Actium, which he, as the General Octavius, won against the armies of Antony and Cleopatra. After ruling for four years under his own name, he took the name of Augustus in 727 A. U. C. Though Dionysius' mistake has long been known, it would cause much confusion to correct it now, so we still continue with his system.

Time Table for December

Dec.	EST	
1	1:00 a. m.	Moon farthest, distance 251,900 miles
3	10:48 p. m.	Algol, variable star in Perseus, at minimum brightness
5	10:13 a. m.	Full moon
6	7:37 p. m.	Algol at minimum
	10:00 p. m.	Venus passes Jupiter
12	early a. m.	Meteors radiating from constellation of Gemini visible
	5:56 p. m.	Moon passes Saturn
	8:48 p. m.	Moon in last quarter
13	3:43 a. m.	Moon passes Mars
17	2:00 a. m.	Moon nearest, distance 226,500 miles
19	1:55 p. m.	New moon
21	11:24 p. m.	Sun farthest south, winter commences in northern hemisphere
22	3:21 a. m.	Moon passes Jupiter
	6:05 p. m.	Moon passes Venus
24	12:32 a. m.	Algol at minimum
	9:00 p. m.	Planet Uranus nearest, distance 1,669,000,000 miles
26	10:00 a. m.	Venus at greatest brilliancy
27	1:31 a. m.	Moon in first quarter
28	7:00 p. m.	Moon nearest, distance 251,400 miles
29	6:10 p. m.	Algol at minimum

Subtract one hour for CST, two hours for MST, and three for PST.

Science News Letter, November 26, 1949

ENGINEERING

Air Compressor May Be New-Type Auto Engine

➤ AN AIR compressor from a German submarine may develop into a new type of automobile or truck engine, Stanford engineers assert. From pushing torpedoes to powering cars is an easy step. Its advantage over other engines is lightness, lack of vibration and low cost.

It is described by them as a "free piston" diesel compression. It will run on low grade oil. It can take 70 cubic feet of free air a minute and compress it to 3,000 pounds per square inch of compressed air. As an engine, it would produce hot gases, roughly at a pressure of 100 pounds per square inch, and these gases would drive a turbine which in turn would drive a shaft.

Tests on this former German U-boat compressor are being made by W. H. Chamberlain, graduate student in engineering. The work is sponsored by the Office of Naval Research. It is aimed at analyzing the thermodynamic and dynamic design aspects of both the air compressor and prime mover types of free piston systems.

The free piston engine is not new. It was invented by a Frenchman named Rault de Pescara some 20 years ago. He and other scientists in France are still carrying on extensive development work. It is the recent interest in this type of engine both in France and Germany that has inspired the American study.

The design of the engine is characterized by extreme mechanical simplicity, according to Prof. A. L. London of Stanford. Theoretically the free piston diesel-turbine prime mover has a higher thermal efficiency than the modern diesel.

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The Soviet port of *Murmansk* on the European Arctic coast is ice-free the year round because of the American Gulf Stream, part of which passes north of Norway into the Arctic Ocean.

ORDNANCE

Improved Subs Ahead

➤ THE submarine will become the primary instrument of naval attack in wars of the future, it was predicted by Lloyd H. Norman in ORDNANCE (Nov.-Dec.), official journal of the American Ordnance Association.

The submarine will remain after the big flattops, the battleships, the cruisers, and most other surface warships have been retired, this wartime naval officer declares. It is the cheapest and most effective naval weapon for its cost, he added, but present day submarines are still in their infancy.

Submarines of today, however, are vastly improved over the recent wartime type. The Navy is now building two new underwater vessels far superior to any now in use. They will cost about $21,000,000 each and will include much that is new in submarine construction, including advances made by the Germans during the war. They will be equipped with improved diesel engines, but may later be adapted for a new type like the Walter engine—or atomic power if it becomes feasible.

The so-called Walter engine is a German development which uses hydrogen peroxide. It is said to be extremely efficient, particularly for emergency speeds of 25 knots, but studies made at the Naval laboratories at Annapolis show that it is extremely uneconomical because it requires peroxide of 90% purity.

The efficient German Kreislauf engine is also being adapted for American use. It is a diesel which uses its own exhaust gases supplemented by injections of pure oxygen from oxygen tanks. This engine permits deep underwater operation without use of the schnorkel breathing device. The schnorkel is a tube which can be projected some 50 to 60 feet above a submerged boat into the atmosphere. By this means a submarine may remain under water for many days.

Twenty-four of America's wartime submarines are under conversion with schnorkel installations and other improvements. They are being streamlined by the removal of deck guns and are being given greater battery capacity.

Science News Letter, November 26, 1949

Christmas - Wonderful Christmas

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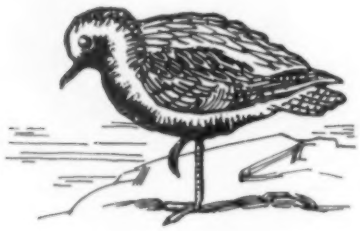
ORNITHOLOGY

NATURE RAMBLINGS



Bird Migrations

➤ AMONG the many things that man has in common with the animals is a tendency to stay put. In some primitive human societies tribes of nomads and hunters have been known to follow the seasons in limited migrations. Some animals make similar adjustments to seasonal changes.

But the great migrations over long distances are made by birds and fishes. Both perform prodigious feats of navigation and endurance, but the more spectacular, possibly because the evidence is more readily apparent, are the seasonal comings and goings of the birds.

The lengths that birds go to to find a climate that suits their taste are simply staggering. Petrels, a kind of sea bird, nest on islands in the Antarctic region. For the winter, they fly all the way up to North America. Golden plovers raise their young on the shores of the Arctic Ocean. Before the long winter freeze sets in, they take wing for the Argentine pampas. They do not cover this tremendous distance, as you might expect, in a straight line "as the crow flies." The first leg of their journey is easterly, following the northern coastline of the continent. Not till Labrador do they start heading south. But once pointed in the direction of their winter home, they stay on course even though this means flying over open sea for 2400 miles.

Another great traveler, probably the greatest of all, is the Arctic tern. He travels from the Arctic to the Antarctic, covering more than 20,000 miles on the round trip.

The ducks, at which thousands of Americans are blasting away from damp and chilly duck-blinds all over the country, are here for the winter from their nesting grounds in northern Canada. It is a grim commentary on the bitterness of the northern winter that the birds still prefer to risk the deadly barrage that awaits them in our milder climate.

What guides the birds on their lengthy migrations remains a mystery. The usual answer is "instinct," but that merely names the phenomenon without explaining it. There are many arguments to disprove the theory that they follow familiar landmarks. The most convincing is the fact that the last birds to leave are the young birds born that year. The older birds who have made the flight before are gone. And yet the youngsters follow the traditional flyway unerringly.

Recently the explanation has been suggested that the birds are guided by the magnetic field of the earth. This theory has been neither proved nor disproved. It would carry more conviction if all birds flew in direct north and south lines. On the contrary, each kind of bird has its own characteristic flight path. For example, there are two kinds of palm warbler which summer in eastern and western Canada, respectively. The western type winters in the West Indies, the eastern type in the Gulf States. Their paths cross at right angles over Alabama and Georgia. It is hard to square this fact with the magnetic field theory.

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NUCLEAR PHYSICS

New Instrument to Detect Nuclear Rays Demonstrated

➤ NUCLEAR rays of atomic bomb fame can be detected with a new instrument demonstrated at the National Bureau of Standards to a group of scientists. The instrument has also many other applications.

It can be used by medical men to follow the course of isotopes injected into the human body and to record the output of vacuum phototubes and in the measurement of light intensities for ultraviolet or visible spectrum analysis.

The new instrument is a product of the Brown Instrument Division of Minneapolis-Honeywell Regulator Company and will be known as the Brown electrometer. Walter Wills of the Brown Company stated that it can measure and record the flow of current or radiation without attendants and the maximum deviation from accuracy will never be more than 0.3 millivolts in one day.

A single instrument without any alteration has a hundred variations in currents which it will measure, by means of a range-changing switch. With mercury switch mechanisms added, signal lights or alarms can be turned on, he stated, when dangerous rays are detected or electrical current becomes too high or too low.

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• Books of the Week •

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ANCIENT MAN IN NORTH AMERICA—H. M. Wormington—*The Denver Museum of Natural History*, 3rd ed., rev., 198 p., illus., paper, $1.50 (Cloth: $2.50.) A survey of the subject with an explanation of the many new developments since the second edition appeared in 1944.

AUDIOLOGY: The Science of Hearing—A Developing Professional Specialty — Norman Canfield—*Thomas*, 45 p., $1.75. On the organization and operation of audiology centers where various professions cooperate to solve problems resulting from hearing loss.

BIOLOGY—Frank M. Wheat and Elizabeth T. Fitzpatrick—*American Book*, 571 p., illus., $3.40. A text for use in the tenth grade of high school. Scientific terms are limited to those in frequent use. Numerous good photographs add attraction to the book.

EXCAVATIONS OF UPPER MATECUMBE KEY, FLORIDA—John M. Goggin and Frank H. Sommer III; EXCAVATIONS IN SOUTHEAST FLORIDA—Gordon R. Willey—*Yale University Press*, 238 p., illus., paper, $3.50. Purpose was to obtain information on the archaeology of the southeastern United States and also to determine whether or not there are connections between Florida and the West Indies.

FORENSIC SCIENCE AND LABORATORY TECHNICS—Ralph F. Turner—*Thomas*, 240 p., illus., $6.50. A text and reference book on scientific crime detection.

GARDEN IN YOUR WINDOW—Jean Hersey—*Prentice Hall*, 272 p., illus., $3.00. The when, where and how of window gardening. For laymen.

HANDY MANUAL OF HOUSE CARE AND REPAIR—Arco Editorial Board—*Arco*, 113 p., illus., $1.00. Brings together in step-by-step directions solutions for many of the common household problems.

HEALTH SERVICES FOR MASSACHUSETTS CHILDREN—Lendon Snedeker—*American Academy of Arts and Sciences*, 132 p., paper, free upon request to publisher, 28 Newbury St., Boston 16, Mass. Report of the Massachusetts Study of Child Health Service which is part of a national survey conducted by the American Academy of Pediatrics.

HIGHWAY RESEARCH BOARD: Proceedings of the Twenty-Eighth Annual Meeting—Roy W. Crum, Fred Burggraf and W. N. Carey, Jr., Eds.—*Highway Research Board*, 536 p., illus., $7.50. Technical papers of interest to highway engineers.

HOW TO GET THE JOB—Mitchell Dreese—*Science Research Associates*, 48 p., illus., paper, 60 cents. A timely booklet now that job-hunting is becoming more engaged in. One of the Life Adjustment Series prepared for teenagers.

HUMAN GROWTH—Lester F. Beck—*Harcourt, Brace*, 124 p., illus., $2.00. The author puts forth in simple terminology the important facts of male and female human growth. Primarily for the teen-ager, adults will also find some valuable information. Partially in question and answer form.

JAILBAIT: The Story of Juvenile Delinquency—William Bernard—*Greenberg*, 216 p., $2.50. Presents the facts, as the author sees them, about delinquency. The author attempts a new and penetrating theory of its origins.

KAOLIN CLAYS AND THEIR INDUSTRIAL USES—*J. M. Huber Corporation*, 141 p., illus., free of charge (to executives and technicians in the clay consuming industry) upon request to publisher, 342 Madison Ave., New York 17. A review of the technology of producing, refining, testing and using clay.

MAN AROUND THE HOUSE—Norbert Engels—*Prentice Hall*, 195 p., illus., $2.95. A pleasant how-to-do-it book for the man who enjoys puttering.

MODERN ARMS AND FREE MEN: A Discussion of the Role of Science in Preserving Democracy—Vannevar Bush—*Simon and Schuster*, 273 p., $3.50. The scientist selected by President Roosevelt to head the National Defense Research Committee talks about cold war and what to anticipate in hot war and appraises the threat of the atomic bomb.

MONEY AND YOU—J. K. Lasser and Sylvia F. Porter—*Science Research Associates*, 48 p., illus., paper, 60 cents. Written to tell teenagers how to get money, how to save it and how to spend it. One of the Life Adjustment Booklets adapted from the authors' "How To Live Within Your Income."

A NEW ERA IN WORLD AFFAIRS—Harry S. Truman—*Gov't. Printing Office*, 58 p., paper, 20 cents. Selected speeches and statements made by President Truman from January 20 to August 29, 1949.

PHYSICAL CHEMISTRY—Frank H. MacDougall—*Macmillan*, rev. ed., 722 p., $5.00. Discussion of nuclear reactions has been amplified since the first edition of this introductory textbook.

PROBLEMS OF HUMAN ADJUSTMENT—Lynde C. Steckle—*Harper*, 351 p., illus., $3.00. Presents a practical approach to the main problems of human living—sex, marriage, vocation, religion, and old age. Under the editorship of Gardner Murphy. A text for courses in Mental Hygiene.

PSYCHOLOGICAL PROBLEMS IN MENTAL DEFICIENCY—Seymour B. Sarason—*Harper*, 366 p., illus., $5.00. The author's evaluation of current psychological theories and practices in the field of mental deficiency.

RADIANT HEATING—T. Napier Adlam—*Industrial Press*, 2nd ed., 504 p., illus., $6.00. A treatise on American and European practice in the design and installation of systems for radiant or panel heating, snow melting and radiant cooking. For students and engineers.

STRATIGRAPHY AND PALEONTOLOGY OF THE BROWNSPORT FORMATION (SILURIAN) OF WESTERN TENNESSEE—Thomas W. Amsden—*Yale University Press*, 138 p., illus., $5.00. Report of detailed study of an area rich in fossils, made for Peabody Museum of Natural History.

WRITING AND SELLING FACT AND FICTION—Harry Edward Neal—*Wilfred Funk, Inc.*, 192 p., $2.00. A readable and practical book on writing for publication. The author uses his own wide experiences for source material.

ZEIN: Versatile Packaging Resin—Ronald L. Clark and Ray C. Gralow—*Mellon Institute*, 5 p., illus., paper, free on request to publisher, University of Pittsburgh, Pittsburgh 13, Pa. Describing a polymer derived from corn that has unusual properties in adhesives and as a scuff-resistant label coating.

Science News Letter, November 26, 1949

• New Machines and Gadgets •

For addresses where you can get more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N. St., Washington 6, D. C. and ask for Gadget Bulletin 493. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

RUG AND UPHOLSTERY CLEANING PREPARATION, a combination of selected and blended detergents, is said to be easy to use and unusually effective for this purpose but can be employed also to clean porcelain, painted wood and window glass. It is non-inflammable, odorless and kind to hands.

Science News Letter, November 26, 1949

HEAT-TREATMENT APPARATUS, to harden rail joints after railroad tracks have been laid, is a portable blowtorch affair of light weight, usable by an unskilled operator. This recently patented device maintains a proper rate of movement back and forth across the joint, with a proper pause at the end of each stroke.

Science News Letter, November 26, 1949

CIGAR-CIGARETTE LIGHTER for the home or office is similar to the familiar lighter used in automobiles but operates on the ordinary household electric current. Although made in various designs, these pop-up lighters are equipped with electro-mechanical chassis identical in all models.

Science News Letter, November 26, 1949

VELON PLASTIC BEDSPREADS, shown in the picture, have the appearance and texture of luxury fabrics but keep their smart good looks with a minimum of care. A damp cloth will remove everyday dust and stains, even baby's spilt milk. They come in metallic colors of blue, green, rose and gray.

Science News Letter, November 26, 1949

ANTI-CLOGGING DEVICE for roof drains is inserted in the gutter end of the down-pipe and provides turbine elements operated by water entering the drain. Suction ordinarily created in the drain, which draws materials against the strainer, is prevented by the turbine action in this recently patented invention.

Science News Letter, November 26, 1949

NAIL EXTRACTOR for automobile tires, recently patented, is a toothed device to mount on the tread of the tire in a stationary position which will intercept nails and other small bodies embedded in the rubber as the tire is rotated past it.

Science News Letter, November 26, 1949

CLOTHES HAMPER, that fits under the wall-attached bathroom wash basin, has adjustable sides which permits it to be easily placed under any standard fixture. Sturdily built of enameled steel, it effectively conceals drain pipes and makes use of what otherwise is waste space.

Science News Letter, November 26, 1949

INFRA-RED HEAT LAMP, an industrial 500-watt sealed beam affair, utilizes a new type of tungsten filament and has the inside of its bulb lined with pure polished silver that acts as a built-in reflector. A protective supporting structure for the filament is a type never before used in heat lamps.

Science News Letter, November 26, 1949

• Do You Know? •

Some 5,500 *automotive patents* will probably be issued this year.

Bacteria need their vitamins just as humans do; capitalizing on this fact, scientists are using microscopic life to measure the vitamin content of food.

The *witch hazel shrub* waits in the autumn until its leaves have turned a golden yellow before it bursts out with its stemless clusters of yellow flowers.

Gypsum plaster, with the mineral vermiculite instead of sand as an aggregate or filler, is claimed to give two to four times the fire protection provided by ordinary sand plaster.

Flavoring foods is the best-known use of common *salt* but far greater quantities are used in the manufacture of chemicals, explosives, paper, fertilizers, soap, steel, glass dye setting, water softeners and for thawing ice.

Modern *farm management* includes border planting of trees, shrubs and lespedeza grass for the benefit of wildlife as well as to prevent erosion and serve as a windbreak; some wildlife yields fur, others destroy insect pests.

Natural gas and *petroleum* are often found in the same underground deposits because both originated, it is believed, in past geological ages from marine organisms which were buried in the muds in ocean bottoms.

The largest *salt mine* in the world is believed to be one in New York State that produces some 4,000 tons daily in a single shift; in the past 20 years it has yielded over 12,000,000 tons of salt.

Norway will have 119 whaling vessels and 10 processing ships in the Antarctic during the present *whaling season;* one factory boat will can whale meat, liver paste and other whale products as well as processing the oil.

Vermiculite, coming more widely into use in lightweight concrete and plaster, is an aluminum-iron-magnesium-silicate mineral, heavy as found in nature but which expands permanently about 15 times in volume under heat-treatment.